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In 1964 Tarte, Gadlin, and Ehrlich found a correlation between Galvanic Skin Response (GSR) and associative meaning in an auditory recognition task. This study attempted to replicate the results and examine the critical variables involved. One hundred eighty female college students served as subjects. Each heard ten accelerated words followed by an interval of .2, 2, or 20 seconds and then a single word at normal speed. The task was to indicate whether or not the test words had been in the list of accelerated words, and how certain the subject was. The test word correlated with one of the ten accelerated words in one of the following ways: (1) correct--actually a word from the list, (2) semantic--high semantic relatedness, (3) phonetic--rhyming with one of the accelerated words, (4) wrong--not related in any ascertainable manner. Each subject received 24 separate trials. There were five different conditions for the accelerated items, ranging from normal (two words per second) to double compressed (four words per second). GSR was used as a measure of arousal and was recorded throughout the session. Two major effects were observed: (1) the measure of certainty varied consistently across all conditions with subjects most certain in the correct condition and least certain in the wrong condition, and (2) GSR deflections increased as the delay interval increased. (Author/DO)

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PSYCHOLOGICAL AND ASSOCIATIVE MEANING IN AUDITORY RECOGNITION[1]

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180 female college students served as subjects. The procedure was as follows: each subject heard 10 accelerated words followed by an interval of .2, 2, or 20 sec. and then a single word at normal speed. The task was to indicate whether or not the test word had been in the list of accelerated words, and how certain the subject was. The test word was related to one of the 10 accelerated words in one of the 5 following ways: a) Correct (C)--actually a word from the list; b) Semantic (S)--high semantic relatedness to one of the 10 accelerated words; c) Phonetic (P)--rhyming with one of the accelerated words; d) Wrong (W)--not related in any ascertainable manner. Each subject received 24 separate trials. There were 5 different conditions for the accelerated items: normal (2 words per sec.), mid (3 words per sec.) double (4 words per sec.), mid-compressed (3 words per sec. with no pitch increase), or double compressed (4 words per sec. with no pitch increase). These 5 conditions plus the 3 delay intervals made 15 groups of 12 subjects.

Galvanic Skin Response was used as a measure of arousal and was recorded throughout the session. Deflections were measured from the onset of each test word for 10 sec.

2 major effects were observed: a) The measure of certainty varied consistently across all conditions with subjects most certain in the correct condition (C) and least certain in the wrong condition (W), and b) GSR deflections increased as the delay interval increased.

In 1964, Tarte, Gadlin, and Ehrlich found a correlation between Galvanic Skin Response (GSR) and associative meaning in an auditory recognition task. The present study attempts to replicate the results and examine the critical variables involved.

Method

Subjects. One hundred eighty female college students who had never participated in a GSR experiment served as subjects.

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Apparatus. A Fels dermometer manufactured by the Yellow Springs Instrument Company was used to measure GSR. The data were recorded on FM magnetic tape and also on a Honeywell Visicorder. A Digital Equipment PDP-4 computer aided in data analysis. Speech compression was achieved with an electronic speech compressor (Eltro).

Stimuli. Two hundred sixty-four one-syllable, four letter words were selected as stimuli and divided into 24 lists of 11 words each. The last word in each list served as the recognition word (R) and was always presented at normal speed. The relationship between the recognition word and the 10 preceding words varied in one of 4 ways:

1. In the correct condition (C), R was a repetition of one of the 10 words;
2. in the semantic condition (S), R was semantically related to one of the ten words;
3. in the phonetic condition (P), R rhymed with one of the ten;
4. the wrong condition (W), R was not related to any of the preceding words in any ascertainable way.

Both position of the key words and type of relationship were varied randomly throughout the lists. Fifteen stimulus conditions were prepared in the following manner. First, a master tape was composed with the words presented at a rate of two per sec. The speed was then doubled to provide a condition of four words per sec. with a corresponding increase in pitch. Altering the speed of the master tape recorder with a variable transformer permitted a mid-condition of three words per sec. The speech compressor was used to make comparable tapes of three and four words per sec. without change in pitch. Delay intervals of .2, 2, and 20 sec. were included in each of the 5 recordings between each list and the following recognition word, providing a total of 15 stimulus conditions (i.e., 5 recordings by 3 time intervals). GSR was recorded throughout the experimental session and measured during the 10 sec. interval between the recognition word and the onset of the next list. Thus, the stimuli were presented as follows: The word "Ready"--2 sec. interval--list presented at either normal, mid, double, mid-compressed, or double compressed speeds--.2, 2, or 20 sec. interval--recognition word--10 sec. interval during which GSR is measured--the word "Ready" and a repetition of the procedure with the next list (see Figure 1).

Insert Fig. 1 about here

Procedure. There were 12 subjects assigned to each of the 15 experimental conditions; they served individually in an audiometric room. The stimulus tapes were presented through a loudspeaker in the corner. A scale ranging from 0 to 9 was attached to the subject's chair to register certainty measurements. By moving a knob across the scale, the subject proportionally changed the amplitude of a signal recorded on the FM tape recorder.

Two zinc electrodes were attached to each subject according to the method described by Lykken (1959). Five minutes were allowed for adaptation, then the subject was seated in the experimental room and the following instructions were read:

> In this experiment, your task will be fairly simple, because each trial is the same. First you will hear the word "ready", then you will hear a list of speeded up words. They are all common four letter English words. Then you will hear a word read at normal speed. Your job is simply to tell me whether the normal speed word was in the preceding list. You will do this by moving the knob in front of you. If you are certain the word didn't occur, then move it to -50. If you are certain the word did occur, then move it to +50. If you are not sure, then move the knob somewhere in between according to your degree of certainty. Keep your hand on the knob, and make the decision right after you hear the normal speed word. Remember, no one is expected to perform perfectly, so make a decision for each list. Are there any questions?

Questions were answered by re-reading the relevant part of the instructions. The subject merely indicated whether or not the test word was one of the preceding ten words and how certain he was; he was not informed that test words were related to key words in various ways.

The 24 lists of stimuli were divided into 4 starting points, namely lists 1, 7, 13, 19, and 3 of the 12 subjects in each subgroup were assigned to starting positions in order to control for any primacy effect.

Results and Discussion

Arousal was measured as the percentage change in GSR relative to the baseline level of responding. Every subject had a GSR score and a certainty score for each list.

One major finding was that, as the delay interval increased, arousal also increased (see Figure 2). The estimated standard error of the means for GSR's

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Insert Fig. 2 about here

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is about .2 and hence it is evident that most of the means differ at the .05 level of significance or greater. In all cases but one, arousal increased as the delay interval increased. The probability of this orderly increase occurring by chance is much less than .001.

The certainty estimates were scored on a scale ranging from 0 to 9 with 4-1/2 representing the neutral point. Therefore, a score of 0 would indicate the subject was certain the recognition word occurred in the list and a score of 9 would indicate the subject was certain the word did not occur.

Figure 3 shows the certainty for all conditions. Not only do the certainties

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Insert Fig. 3 about here

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vary consistently but most of the differences between correct, semantic, phonetic, and wrong conditions are highly significant, since the estimated standard error of the means is about .15. The certainty measure seems to be valid, since one would expect low means for the correct condition and high means for the wrong conditions. In addition, rhyming words might be more easily confused with each other than words which are semantically related. If so, it would be expected that certainties during the phonetic condition would be lower than the certainties during the semantic condition. The certainties do in fact fall in the expected order with the wrong condition highest, then semantic, then phonetic, and finally the lowest being the correct condition. The only exception to this order is in the double compressed condition. If difficulty increases as the speed of presentation increases and if the measure of certainty used was valid, then the values for the certainties should approach the neutral point, 4-1/2. Again, the certainties fall in the expected order. The data indicate that the method used to obtain certainty estimates is valid and also reliable across these experimental conditions.

Finally, one interesting negative finding is the absence of a correlation between GSR and certainty estimates.

References

Lykken, D. T. Properties of electrodes used in electrodermal measurements. Journal of Comparative and Physiological Psychology, 1959, 52, 629-634.

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Footnote

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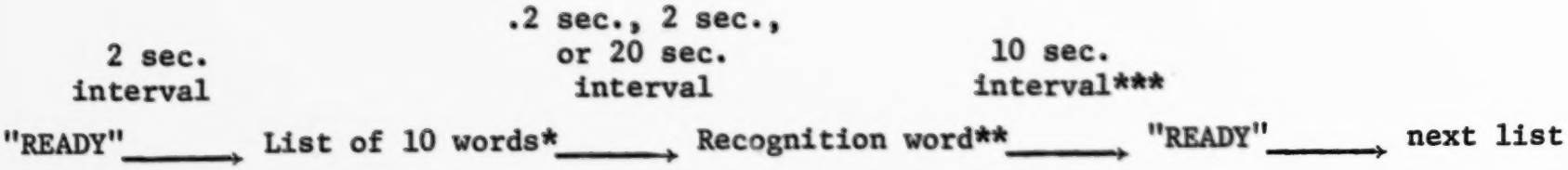
Figure Captions

Fig. 1. Schematic diagram of one trial as presented to the subjects.

Fig. 2. Arousal (per cent change from basal resistance level) as a function of delay interval, over conditions.

Fig. 3. Mean certainty estimates as a function of presentation method and delay interval over conditions.



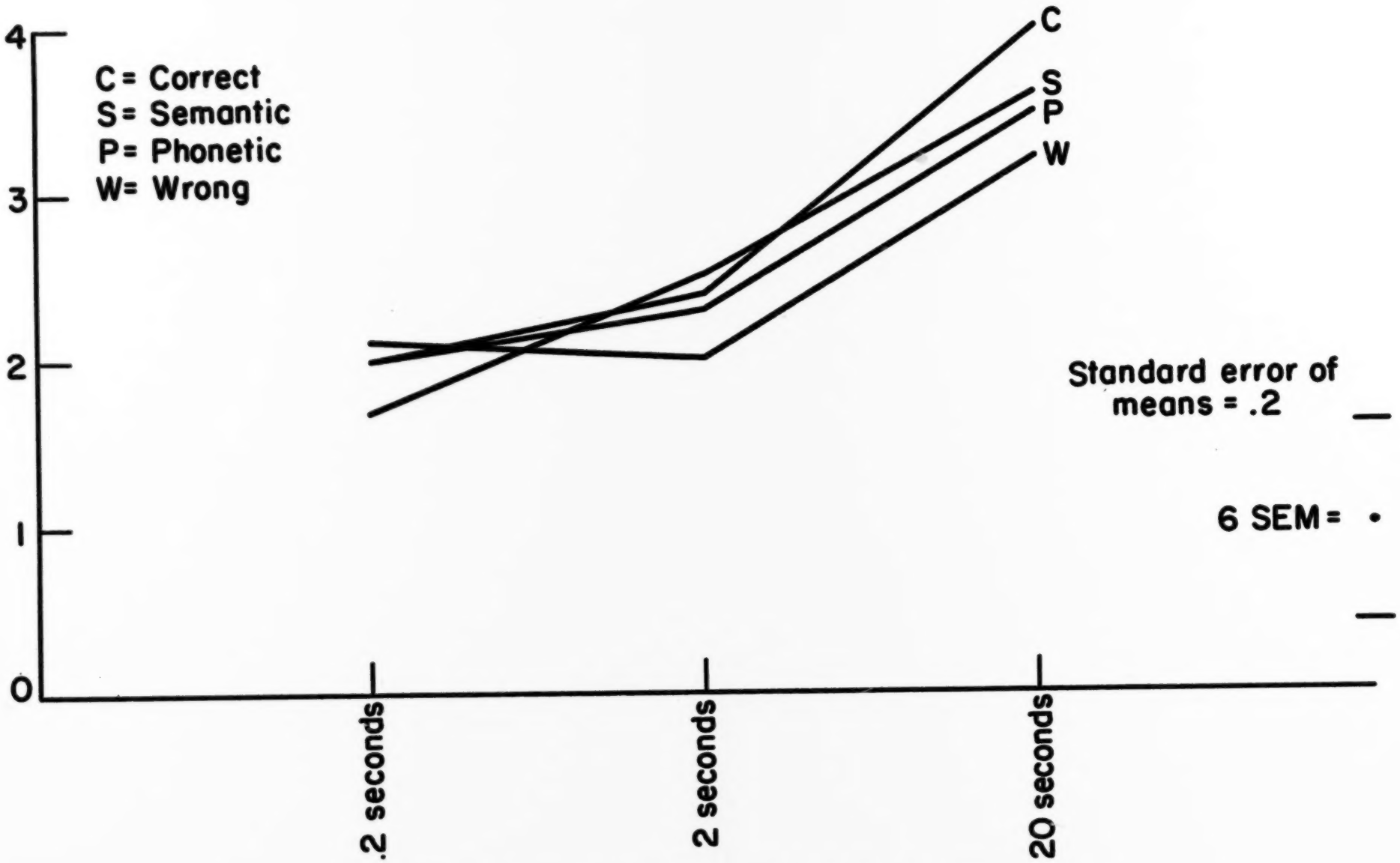
* Either:

1) normal
   2 wd/sec.
2) mid
   3 wd/sec.
3) double
   4 wd/sec.
4) mid compressed
   3 wd/sec.
   with no pitch change
5) double compressed
   4 wd/sec.
   with no pitch change

** Always normal speed

*** GSR measured here

Figure 1



AROUSAL AS A FUNCTION OF DELAY INTERVAL

Figure 2

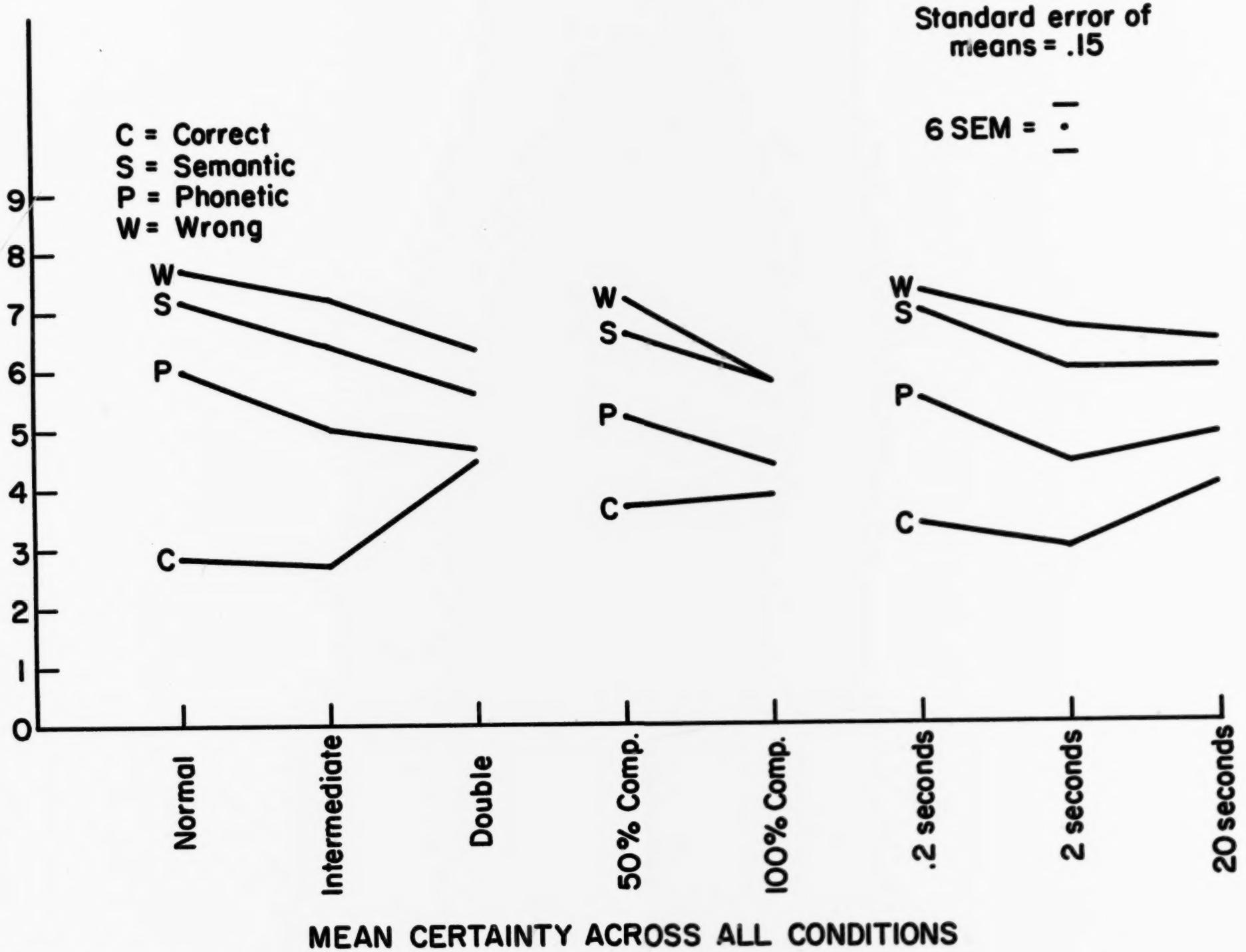

C = Correct
S = Semantic
P = Phonetic
W = Wrong
Standard error of means = .15
6 SEM =
9
8
7
6
5
4
3
2
1
0
W
S
P
C
Normal
Intermediate
Double
50% Comp.
100% Comp.
.2 seconds
2 seconds
20 seconds
MEAN CERTAINTY ACROSS ALL CONDITIONS

Figure 3